What is claimed is:

1. A device for performing percutaneous transmyocardial revascularization, including:

an elongate catheter having a proximal end and a distal end, a catheter wall defining a compartment within the catheter, and at least one window through the catheter wall open to the compartment;

a cutting element compressible into a reduced diameter when positioned within the compartment and tending to radially expand beyond the catheter wall when positioned near the at least one window; and

a control component coupled to the cutting element and operable to selectively position and move the cutting element to a location near the window to allow said radial expansion through the window.

2. The device of claim 1 further including:

support strands adapted to be manipulated into contact with a first tissue surface to locate the at least one window against an opposing second tissue surface;

wherein the cutting edge, when radially expanded, cuts tissue along the second tissue surface.

3. The device of claim 1 wherein:

said tissue cutting element is electrically conductive, and coupled to an energy source comprising a means for generating an electrical current in the cutting edge to heat tissue adjacent the cutting edge at least to a temperature above normal body temperature.

4. The device of claim 3 wherein:

the energy source includes a power supply, and first and second electrical conductors coupled to the power supply and respectively to opposite ends of the cutting edge.

5. The device of claim 3 wherein:

the energy source includes a radiofrequency power source, an indifferent electrode, a first conductor connected to the radiofrequency power source and to the cutting element, and a second conductor connected to the radiofrequency power source and to the indifferent electrode, to maintain the adjacent tissue at least above normal body temperature.

6. The device of claim 1 including:

a component for urging the cutting element against tissue

7. The device of claim 6 wherein:

the component for urging the cutting element includes at least one flexible support strand on the opposite side of catheter from the cutting element.

8. The device of claim 1 including:

a passage for delivering a therapeutic agent to tissue.

9. The device of claim 8 wherein:

the passage includes a lumen inside the cutting element; and

the cutting element contains holes for injecting the therapeutic agent from inside the lumen to tissue adjacent the cutting element.

10. An elongate catheter for cutting incisions into heart tissue comprising:

at least one window through the catheter wall adapted to be positioned against a first tissue surface such that the at least one window faces the first tissue surface;

at least one support strand adapted to be manipulated into contact with a second tissue surface separate from the first tissue surface to force the at least one window into contact with the first tissue surface;

a cutting element adapted to contact the first tissue surface when positioned near the at least one window such that the cutting element cuts tissue adjacent the at least one window to a predetermined depth determined by the shape of the cutting element; and

a first control component coupled to the cutting element and operable to selectively position and move the cutting element along the at least one window.

11. The catheter of claim 10 further including:

a second control component coupled to the at least one support strand and operable to selectively position and move the at least one support strand into contact with the second tissue surface.

12. The catheter of claim 10 wherein:

said tissue cutting element includes an electrode adapted for a coupling to an energy source for generating an electrical current in the electrode to heat tissue adjacent the electrode at least to a temperature above normal body temperature.

13. The catheter of claim 12 wherein:

the energy source includes a power supply, and first and second electrical conductors coupled to the power supply and respectively to opposite ends of the electrode.

14. The catheter of claim 12 wherein:

the energy source includes a radiofrequency power source, an indifferent electrode, a first conductor connected to the radiofrequency power source and to the electrode, and a second conductor connected to the radiofrequency power source and to the indifferent electrode, to maintain the adjacent tissue at least above normal body temperature.

15. The catheter of claim 10 wherein:

the cutting element includes a lumen connected to a port near the proximal end of the catheter; and

the cutting element further includes holes coupled to the lumen and adapted to pass a therapeutic agent from the port into tissue adjacent the cutting element.

16. The device of claim 10 wherein:

the cutting element is elastically compressible into a reduced diameter to facilitate catheter manipulation within the vasculature, and expandable back to a preformed shape when not constrained means.

17. The device of claim 10 wherein:

the cutting element is shaped to form incisions having a length at least twice an incision width.

18. The device of claim 10 wherein:

the incisions have a length that is greater than their depth.

19. A process for performing transmyocardial revascularization including:

positioning a catheter incorporating at least one window through the catheter wall into contact with an endocardial surface such that the at least one window faces the endocardial surface; and

using a cutting element projecting through the window to form at least one incision through the endocardial surface to a depth within the myocardium along a first line, wherein the at least one incision has a length substantially greater than its width and is positioned adjacent the at least one window with said length running substantially parallel to the endocardial surface.

20. The process of claim 19 further including:

positioning the catheter in contact with the endocardial surface along a second line spaced apart from the first line; and

creating at least one incision along the second line.

21. The process of claim 19 wherein:

at least two incisions are created along the first line; and

the at least two incisions are separated by a gap of uncut endocardium.

22. The process of claim 19 further including:

injecting a therapeutic agent directly into the at least one incision.

23. The process of claim 19 wherein:

the at least one incision has a length that is at least twice as large as a width of the incision.

24. The process of claim 19 wherein:

the at least one channel has a length that is greater than a depth of the incision.

25. The process of claim 19 wherein:

positioning the at least one window includes extending at least one flexible support strand into contact with the endocardial surface to urge the at least one window into contact with the endocardial surface along the first line.

26. A process for treating myocardial tissue, including:

maneuvering a catheter intravascularly to position a distal end region of the catheter inside the heart;

selectively positioning the catheter such that the distal end region of the catheter extends axially along the endocardial surface; and

with the catheter so positioned, causing a cutting element extended axially along said distal region of the catheter to project radially outwardly from the catheter and through the endocardial surface into myocardial tissue, thus to form an incision in the myocardial tissue having an axial length at least twice its width.

27. The process of claim 26 further including:

urging the catheter distal region against the endocardial surface during said projecting of the cutting element.

28. The process of claim 26 wherein:

said projecting the cutting element is accomplished with minimal arcuate movement of the cutting element, and the cutting element is elongate in the axial direction, whereby the incision has an incision width substantially equal to a cutting-element width.

29. The process of claim 28 wherein:

the incision has a length in the axial direction at least ten times the width.